ALEXEI V. VARGANOV

Research Interests

I have always been interested in modern science and technology and fascinated by creativeness of physicsts who designed and performed brilliant experiments, such as elementary particle searches and discoveries. It has been a thrilling experience for me to analyze the data in the harsh background conditions of proton-antiproton beam collisions. State-of-art detectors and advanced analysis techniques make possible to perform the breakthrough measurements such as Top quark discovery or Higgs searches that help us to shed some light on the fundamental interactions and symmetries in nature. I am very excited with the opportunities of the current Tevatron Run II as well as coming LHC experiments.

I did my undergraduate and masters degree work at Novosibirsk State University, where I had nearly perfect GPA and was strongly endorsed for graduate study by my advisors. Since my third year at the university I have been involved in a research project for light vector meson physics at the Budker Institute of Nuclear Physics (BINP) in Novosibirsk, Russia. This experiment is running on the electron-positron collider VEPP-2M with the maximum center of mass energy 1.4 GeV. For my masters thesis I was studying the properties of light scalar mesons using Spherical Neutral Detector (SND), which is a particle detector with high resolution EM calorimeter and tracking system.

I came to the University of Michigan in the Fall of 1998. Given my rigorous preparation, I completed the coursework with outstanding GPA in two years. By the summer of 1999, I had begun research with the CDF Collaboration (one of two major facilities at the Tevatron accelerator at Fermi National Accelerator Laboratory) under the guidance of Professors Dan Amidei and Myron Campbell and research associate Stephen Miller. In a very short time I was given a task to design and develop a relational database to set up and configure the CDF online trigger. The trigger system works in real time making decisions at a rate of 7 MHz to determine which events will be recorded to tape and which will be discarded. This filter accepts approximately one "interesting" event out of every 100,000 collisions. Every physics result that emerges from CDF experiment depends, therefore, on this database and its interaction with the triggers, so it must be reliable, robust, and easily configurable by experimenters wishing to search for particular processes.

By the end of my second year at Michigan I moved to the Fermilab to continue the work on the trigger database development. Simultaneously, I was working on the integrating of the trigger database user interface with the Data Acquisition system and software support for various components of the trigger. The Commissioning Run taken during the Fall 2000 showed a great success of the upgraded trigger system. By that time most of the trigger pieces (such as calorimeter, tracking, muon, and global decision) were configured using Oracle-based database and Java-written graphical users interface. Since the beginning of the Run II data taking my responsibility included maintenance and normal operation of the trigger data base and associated software. I also performed

series of training sessions at CDF where I instruct the trigger experts on how to configure the triggers.

Soon after a new Run II data became available from the upgraded CDF detector, I started analyzing the high-P_T muon dataset, trying to produce the first results for $W^{\pm}$, Z^0 production cross section measurements. These basic electro-weak processes serve as a benchmark for many new physics processes involving $W^{\pm}$, Z^0 leptonic decays. Also top physics measurements in lepton + jets and dilepton channels rely heavily both on the high-P_T muon identification and $W^{\pm}$ event count.

The main challenge in this analysis is the identification of the high-P_T muons resulting from the $W^{\pm}$ and Z^0 decays among the fake muons coming from the cosmic rays and other non-electroweak sources such as QCD processes. To solve this problem various detector systems including tracker, calorimeter and muon chambers need to be involved in the signal selection algorithm. For such a complicated analysis it's imperative to have a large data sample to avoid the results limited by large statistical and systematic errors. However, by calculating a cross section ratio $\sigma(p\bar{p} \to W \to \mu\nu)/\sigma(p\bar{p} \to Z \to \mu\mu)$ one can obtain a high precision measurement where many parameters and uncertainties are reduced. Using this ratio one can extract the value of W width and compare it to the Standard Model prediction.

In the Fall 2001 I gave a talk at the CDF collaboration meeting where the first Run II studies for high-P_T muons were reported. By Spring 2002 a CDF note was released with the preliminary results based only on 3.5 pb^{-1} of the new data. Although statistically limited by the data, these early studies were extremely valuable for validating both muon hardware and reconstruction algorithm performance. As a result of this work, necessary corrections and adjustment were introduced for proper muon geometry and alignment with respect to the other detector systems. Updated results on W and Z production cross section measurements in muon channel were presented by CDF collaboration for the Summer 2002 and Winter 2003 conferences based on integrated luminosity of 16.5 pb^{-1} and 72 pb^{-1} respectively.

The latest results based on 200 pb^{-1} of new data are presented in my Ph.D. thesis *Measurement of the Ratio of Inclusive W and Z Cross Sections and Extraction of the W Width at the Tevatron.* Apart from presenting the high precision measurement, this work also summarizes and finalizes the high-P_T muon analysis methods that are used for other high energy physics searches.

I would like to continue to pursue my carrer in a post-doc position in University High Energy Experimental groups or a National Lab. I am looking for an interesting and challenging work with the right balance of physics analysis and the detector development for both ongoing and future experiments.